

A review of the Palaearctic Neorhacodinae (Hymenoptera, Ichneumonidae) with *Eremura* Kasparyan, 1995 new to the west Palaearctic

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SYNOPSIS. A review of Palaearctic Neorhacodinae is given including an outline of the characters of the subfamily, a key to all species and descriptions of all genera and species. *Eremura* is recorded as new to the west Palaearctic region.

INTRODUCTION

Neorhacodinae is a small subfamily of inconspicuous ichneumonid wasp parasitoids comprising two distinct but uncommon genera in the Palaearctic; that is, *Neorhacodes* with one species well known in western Europe as a parasitoid of *Spilomena* spp. (Sphecidae) nesting in stems (e.g. Horstmann, 1968; Danks, 1971), and *Eremura* with two species previously known only from the deserts of Turkmenistan (Kasparyan, 1995) whose biology remains unknown. Neorhacodines may be distinguished from other ichneumonids in the Palaearctic region by the combination of the following characters: fore wing with veins Rs and M fused over a short distance so that there are no rs-m cross veins

(Figs 1, 3, 4); fore wing lacking vein Cu2 (Fig. 1); insertion of metasoma low on propodeum so that the lower edge of its foramen is well below the upper edge of the foramina of the coxal insertions; antenna short, at most fifteen-segmented; spiracles of metasomal tergite anterior to mid-length (Figs 10, 16); fore wing vein 2m-cu absent to nebulous, not tubular (Fig. 1). Rarely other ichneumonids may be found with Rs and M fused, that is, Paxylommatinae and a few Anomaloninae, Cryptinae and Xoridinae, but then the fore wing venation is quite different in other respects and they differ from neorhacodines in at least one of the other characters given above.

A review of Palaearctic neorhacodines is given including an outline of the characters of the subfamily, and a key to all species. Following the examination of

material kindly supplied by J. Blasco-Zumeta, *Eremura* is recorded here as new from Spain and the west Palaearctic. The Spanish material is assigned to *E. perepetshaenkoi*: this species is notable because of its apparent widely disjunct distribution (Spain and Turkmenistan) and its association with desert and semi-desert habitats, which are unusual in a European context. The previously unknown male of *E. perepetshaenkoi* is recognised. *Neorhacodes enslini* is recorded as new to Austria and France.

Nomenclature of wing venation follows Gauld and Bolton (1988). Wing veins were drawn following the convention of Mason (1986).

DEPOSITORIES

BMNH	The Natural History Museum, London, United Kingdom (formerly the British Museum (Natural History)).
REDMG	Reading Museum Service, Reading, United Kingdom.
NM	Naturhistorisches Museum, Wien, Burging 7, Postfach 417, 1014 Wien, Austria.
NMS	National Museums of Scotland, Edinburgh, United Kingdom.
ZMAS	Zoological Museum, Academy of Science, St. Petersburg, Russia.

ACKNOWLEDGEMENTS. We are most grateful to Javier Blasco-Zumeta for donating to the National Museums of Scotland Hymenoptera roughly sorted to Braconidae, from which the Spanish material of *Eremura* was recovered, from his extensive sampling programme at Los Monegros; to Dimitri Kasparyan of the Zoological Institute, Russian Academy of Sciences, St. Petersburg, for loaning types of *Eremura*; to Mike Fitton and Donald Quicke (Natural History Museum, London) for support from Natural Environment Research Council grant number GR3/8060 for initial studies of sub-family characters of neorhacodines; to Mike Fitton (Natural History Museum, London) for subsequent access to collections and use of facilities; to the staff of the Entomology Library of the Natural History Museum, London.

NEORHACODINAE HEDICKE

Rhacodinae Ruschka, 1922: 38. [Invalid proposal based on *Rhacodes* Ruschka, junior homonym of *Rhacodes* Koch].

Neorhacodinae Hedicke, 1922: 427. Type-genus: *Neorhacodes* Hedicke.

DESCRIPTION. Head (Figs 5, 11) lenticular; inner orbits nearly parallel; face with a small tubercle between toruli; clypeus relatively large, projecting

ventrally so that it partially conceals the mandibles when they are at rest, setation sparse on disc, with an irregular fringe on ventral margin, both discal and marginal setae about twice as long as those on face immediately above; occipital carina complete, joining hypostomal carina distant from base of mandibles. Antenna filiform, thirteen- to fifteen-segmented, with the basal flagellar segments attenuated in females, less so in males; labrum normally concealed; mandibles bidentate, not carinate on external face, twisted so that the longer lower tooth is advanced; maxillary palp four-segmented; labial palp three-segmented. Propleuron without a postero-ventral flange overlapping the lower corner of pronotum; mesoscutum strongly convex anteriorly; sternaulus and mesepisternal sulcus absent; mesopleural furrow finely foveate, not angled opposite scrobe; mesosternum without a posterior transverse carina; propodeal spiracle small and round. Fore wing (Figs 1, 3, 4) extending beyond apex of metasoma, its venation generally abbreviated and condensed; veins Rs and M fused over a short distance so that there are no rs-m cross veins; Cu2 absent; 2m-cu absent, nebulous or spectral but not tubular; hind wing (Fig. 2) with one weak basal hamulus at about level of cu-a and three (rarely four) distal hamuli; abscissa of Cu between M+Cu and cu-a about twice as long as cu-a; distal abscissa of Cu spectral or absent; basal cell with a single specialised seta subapically and a short row basally along anterior margin (these setae are longer and more erect than surrounding setae). Legs with trochantellus clearly marked off from rest of femur by a suture; shaft of fore tibia without differentiated spines; apex of fore tibia without a dentiform process; fore basitarsus 0.65–0.85 length of rest of tarsus; apices of mid and hind tibiae with spurs and tarsus sharing a common insertion; mid and hind tibiae each with two spurs; apex of hind tibia without a differentiated transverse posterior comb; tarsal claws simple. Metasoma (Figs 7, 8, 10, 13, 14, 16) inserted low on propodeum, so that the lower edge of its foramen is well below the upper edge of the foramina of the coxal insertions; metasomal tergite one slightly longer than tergite two (measured at mid-line); tergite two with thyridia near basal margin; tergite three without thyridia; tergite two longer than exposed portion of tergite three (measured at mid-line) and not fused with it; apical tergite not produced; anterior, more sclerotised part of metasomal sternite one very short, extending no more than 0.4 length of tergite one, barely visible between hind coxae; female with fourth to sixth metasomal sternites narrowed medially; dorsal valve of ovipositor with a subapical notch (Figs 9, 15); ventral valves abruptly narrowed subapically, their tips needle-like; ovipositor sheaths parallel

sided in lateral view (Figs 10, 16), flexible, transversely striate over most of length.

COMMENTS. The subfamily comprises three small genera, *Eremura*, *Neorhacodes* and *Romaniella*, the last of which is only known to occur in the Neotropical region and is not considered further here. Despite the superficial dissimilarity of *Eremura* and *Neorhacodes*, we concur with Kasparyan's placement of *Eremura* in Neorhacodinae. Probable synapomorphies for *Eremura* and *Neorhacodes* include: the condensed and abbreviated form of the fore wing venation, in particular the fusion of Rs and M; the form of the clypeus; the form of the mandibles and the small number of antennal segments. Neorhacodines are unusual among ichneumonids in that the number of antennal segments appears fixed for each species. For *Eremura perepetchaenkoi* the number is sexually dimorphic, being fixed at fourteen for females and fifteen for males, while for *E. turkmenica* and *Neorhacodes enslini* it is fixed at thirteen for both sexes (but see notes under *N. enslini*).

Key to Palaearctic species of Neorhacodinae

- 1 Metasomal tergites 1–3 dorsally with granulate sculpture and longitudinal striation, each of these tergites with a transverse impression just behind middle (Figs 7, 8); propodeum dorsally with several carinae (Fig. 6); head and mesosoma with obvious granulate sculpture; apex of metasoma dorsoventrally depressed (Figs 8, 10); dorsum of metasomal tergite 1 with basal area delimited by a pair of curved carina (Fig. 7) *Neorhacodes enslini*
- Metasomal tergites 1–3 dorsally smooth and without transverse impressions (Figs 13, 14); propodeum dorsally without carinae (Fig. 12); head and mesosoma mostly smooth, sculpture no more than fine puncturation in part; apex of metasoma laterally compressed (Figs 14, 16); dorsum of metasomal tergite 1 with basal area not delimited (Fig. 13) 2
- 2 Fore wing with radial cell shorter, 2.3–2.8× as long as wide (Fig. 3); vein Rs tubular, at least weakly pigmented, usually straight over basal 0.65 then turning towards costa (Fig. 3), sometimes weakly sinuate; metapleural carina complete, fine but distinct; antenna 14–(♀) or 15-segmented (♂), with the third segment 2.7× as long as its greatest width; toruli distant from compound eyes by 0.8–0.9× greatest internal torular diameter (Fig. 11); pterostigma mostly brown, pale in basal third (Fig. 3) *Eremura perepetchaenkoi*
- Fore wing with radial cell longer, 3.5–3.7× as long as wide (Fig. 4); vein Rs nebulous to spectral, unpigmented and distinctly sinuate (Fig. 4); metapleural carina obsolete anteriorly, the metapleuron delimited anteriorly by a weak depression; antenna 13-segmented, with the third segment almost 5× as long as its greatest width; toruli distant from compound eyes by 1.2× greatest internal

torular diameter (Fig. 17); pterostigma pale yellow with brown margins (Fig. 4) *Eremura turkmenica*

EREMURA Kasparyan

Eremura Kasparyan, 1995: 669. Type-species: *Eremura turkmenica* Kasparyan, by original designation.

DESCRIPTION. Ventral margin of clypeus rounded in frontal view (Fig. 11). Pronotum without epomia or striae; notauli absent; lateral mesoscutal carina not extending posteriorly to scutellum but turning laterally across axillary trough; epicnemial carina extending dorsally only a short distance, turning to join anterior margin of mesopleuron at about level of lower corner of pronotum; dorsal area of metanotum with at most a weak antero-medial fovea, posteriorly convex; propodeum dorsally without carinae (Fig. 12) and with the postero-medial area (just in front of the metasomal insertion) raised so that the dorsal profile is weakly convex. Hind wing with three distal hamuli. Metasomal tergite one without a glymma, with a dorsolateral carina parallel with and close to the lateral margin, delimiting a narrow lateral area in front of the spiracle, this area about 3.5–4.0× as long as wide (Fig. 16); spiracle of tergite one close to its lateral margin and just in front of mid-length (Fig. 16); dorsum of tergite one with a basal area not delimited (Fig. 13); metasoma beyond tergite one weakly sclerotised, tending to collapse and distort on drying, particularly when specimens have been extracted from fluid preservatives, that of the female laterally compressed apically (Figs 14, 16), less compressed in the male; laterotergites of tergite two moderately broad, about half as wide as long, though weakly sclerotised and difficult to see if folded behind tergite (as in Fig. 16), the fold line indicated by band of weak sclerotisation just below level of spiracle and extending 0.6–0.7 length of tergite; tergites three and beyond without such fold lines; female with spiracle on tergite seven subequal to that on tergite six; second and third sternites with weakly sclerotised region medially (Fig. 16); ovipositor extending beyond apex of metasoma by about 0.9 length of hind tibia; ovipositor strongly compressed laterally (Fig. 14) and weakly curved upwards (Fig. 16), although weakly sclerotised and may become strongly curved and twisted in specimens which have been collected in fluid and then dried. Body mostly smooth and shining but weakly scabrous on the lateral propodeum around the spiracle; metasomal tergites without transverse impressions (Figs 13, 14); sclerotised parts of second and third sternites smooth; legs smooth. Body with moderately dense to sparse, fine, short pubescence except the clypeus, which has long setae (Fig. 11), and bare areas dorsally on metasomal tergites two to four (Fig. 14), postero-medially on the propodeum (Fig. 12) and the postero-dorsal half of the mesopleuron.

COMMENTS. This genus has been recorded from Turkmenistan and is recorded as new for Spain. Kasparyan (1995) gave a habitus figure of *E. perepetshaenkoi* which is representative of the genus. Host relations unknown, although there appears to be an association with desert and semi-desert habitats and the laterally compressed metasoma and ovipositor suggest that concealed hosts are attacked.

Eremura perepetshaenkoi Kasparyan

(Figs 3, 11–16)

Eremura perepetshaenkoi Kasparyan, 1995: 672.

Holotype ♀, **Turkmenistan** (ZMAS) (examined).

DESCRIPTION. Ocellar-ocular distance $0.55\text{--}0.65\times$ distance between posterior ocelli; toruli separated by $1.0\text{--}1.1\times$ greatest internal torular diameter (Fig. 11); toruli distant from compound eyes by $0.8\text{--}0.9\times$ greatest internal torular diameter; malar space $0.30\text{--}0.35\times$ (♀) or $0.40\text{--}0.45\times$ (♂) basal width of mandible; malar sulcus indistinct to absent; antenna fourteen-segmented (♀) or fifteen-segmented (♂), with the third segment $2.6\text{--}2.7\times$ (♀) or $2.2\text{--}2.3\times$ (♂) as long as its greatest width and $1.2\text{--}1.3\times$ (♀) or $1.1\times$ (♂) as long as the fourth. Mesoscutum with fine, close puncturation; metapleural carina complete, fine but distinct. Fore wing with radial cell $2.3\text{--}2.8\times$ as long as wide (Fig. 3); vein Rs tubular, at least weakly pigmented, usually straight over basal 0.65 then turning towards costa, sometimes Rs weakly sinuate; 2m-cu absent. Metasomal tergite two with thyridia present but poorly defined (Fig. 14, 16); dorsal valve of ovipositor with subapical notch about three times as long as deep (Fig. 15). Head and mesosoma dark brown to black; metasoma brown to dark brown; antenna dark brown; mandibles dark brown to black with tips red-brown; pterostigma mostly dark brown, but with pale area in basal third (Fig. 3); legs brown except fore and mid tibiae and tarsi which are often yellow-brown, and apices of fore and mid femora and sometimes also bases and apices of tibiae which are yellow to yellow-brown. Body length $1.3\text{--}2.0$ mm (♀) or $1.6\text{--}1.7$ mm (♂); fore wing length $1.3\text{--}2.1$ mm (♀) or $1.6\text{--}1.7$ mm (♂).

MATERIAL EXAMINED.

Holotype. **Turkmenistan**: ♀, Kopet-Dag, Karael'chi range, near Parkhai, 25.v.1993 (*Perepechaenko*) (ZMAS).

Turkmenistan: ♀, Akarcheshme Badkhyzkii, zapk raznotr, 2.v.1990 (*Belokobyl'skii*). **Spain**: 15 ♀, ♂ Zaragoza province, Los Monegros, Retuerta de Pina, 30T YL2794, Moericke/Malaise traps, 7–24.v.1991 (*Blasco-Zumeta*) (BMNH; NMS; ZMAS).

COMMENTS. A habitus figure was given by

Kasparyan (1995). The discovery of *E. perepetshaenkoi* in the Monegros region of the central Ebro valley, east of Zaragoza in northern Spain, is not particularly surprising in view of the large and growing number of taxa from the region found to have disjunct distributions such that they are otherwise known only from the steppes of the eastern Mediterranean or central Asia (Ribera and Blasco-Zumeta, in press). The particular area in which the Spanish specimens were collected is a relatively small undamaged fragment (circa 2000 ha) of forest steppe (with *Juniperus thurifera* and *Pinus halepensis*) surviving near Pina de Ebro known as 'Retuerta de Pina' (UTM grid square 30T YL2794). It is characterised by its climate (Ochoa, 1982) of extreme temperatures, desiccating winds and low rainfall, as well as gypsum soils (Quirantes, 1978), which together lead to a characteristic and species deficient vegetation (Braun-Blanquet and Bolós, 1957). The Monegros area, which is under serious threat of irrigation, is of great scientific significance and is known to support a large number of endemic species of insects and other organisms, of which over 100 have already been described following a recent intensive survey (Blasco-Zumeta, 1996 and pers. comm.).

Eremura turcmenica Kasparyan

(Figs 4, 17)

Eremura turcmenica Kasparyan, 1995: 671. Holotype ♀, **Turkmenistan** (ZMAS).

DESCRIPTION (female only). Ocellar-ocular distance $0.65\times$ distance between posterior ocelli; toruli separated by $0.75\times$ greatest internal torular diameter; toruli distant from compound eyes by $1.2\times$ greatest internal torular diameter (Fig. 17); malar space $0.5\times$ basal width of mandible; malar sulcus fine but distinct; antenna thirteen-segmented, with the third segment $4.7\times$ as long as its greatest width and $1.7\times$ as long as the fourth. Mesoscutum smooth and shining, impunctate; metapleural carina obsolete anteriorly, the metapleuron delimited there by a weak depression. Fore wing with radial cell $3.5\text{--}3.7\times$ as long as wide (Fig. 4); vein Rs nebulous, becoming spectral near apex, unpigmented and distinctly sinuate; 2m-cu nebulous/spectral, unpigmented. Metasomal tergite two with thyridia distinct, transverse. Head and mesosoma dark brown to black; metasoma brown to dark brown; antenna dark brown; mandibles dark brown to black with tips red-brown; pterostigma mostly yellow, finely edged brown (Fig. 4); legs brown except for tarsi, tibiae and apices of femora which are yellow-brown. Body length 1.7 mm; fore wing length 1.7 mm.

MATERIAL EXAMINED.

Turkmenistan: ♀, Kopet-Dag, Karael'chi range, near Parkhai, 25.v.1993 (*Perepechaenko*) (ZMAS) (paratype).

COMMENTS. Male not seen; according to Kasparyan it is similar to the female but slightly larger and there are small differences in the proportions of its antennal segments.

NEORHACODES Hedicke

Rhacodes Ruschka, 1922: 138. Type-species: *Rhacodes enslini* Ruschka by original designation and monotypy. [Junior homonym of *Rhacodes* Koch, 1856].

Neorhacodes Hedicke, 1922: 427. [Replacement name for *Rhacodes* Ruschka].

DESCRIPTION. Ventral margin of clypeus almost straight in frontal view (Fig. 5). Pronotum without a distinct epomia but with several striae crossing lateral furrow; notauli weakly impressed anteriorly and each with a short carina along inner margin; lateral mesoscutal carina extending posteriorly to scutellum; epicnemial carina extending dorsally 0.4–0.5× height of mesopleuron, ending distant from its anterior margin; dorsal area of metanotum with strong antero-medial fovea, posteriorly bordered by a transverse carina; propodeum dorsally with submedial and lateral longitudinal carinae (Fig. 6) and a posterior transverse carina, its dorsal profile angled at line of posterior transverse carina. Hind wing with three or four distal hamuli (Fig. 2). Metasomal tergite one with a deep basal glymma, with a dorso-lateral carina parallel with and close to lateral margin, delimiting a narrow lateral area in front of the spiracle, this area 2.1–2.8× as long as wide (Fig. 10); spiracle of tergite one distant from its lateral margin and well in front of its mid-length (Fig. 10); dorsum of tergite one with basal area delimited by a pair of curved carinae (Fig. 7); tergites one to five strongly sclerotised, not collapsing on drying, the other tergites less sclerotised, retracted and not visible from above; apex of metasoma dorso-ventrally depressed (Figs 8, 10); laterotergites two and three delimited by a sharp crease, very narrow and folded behind rest of tergite; female with second and third sternites coriaceous and evenly sclerotised medially; ovipositor straight (Fig. 10), not strongly compressed laterally but evenly tapered when seen from above (Fig. 8), extending beyond apex of metasoma by about 0.7 length of hind tibia. Most of body with granular sculpture except for pronotum which has fine striae, and axillae, metanotum and propodeum which are more or less smooth with obscure sculpture; metasomal tergites one to three dorsally with granulate sculpture and longitudinal

striation, each of these tergites with a transverse impression just behind the middle (Figs 7, 8); tergite four similar but with transverse impression very weak; tergite five smooth and shining; legs smooth except for mid and hind coxae and hind femur which have granulate to coriaceous sculpture. Most of body with more or less sparse, fine, short pubescence except the mesonotum which has dense pubescence and the posterior pronotum, postero-dorsal mesopleuron, metapleuron and posterior propodeum which are bare.

COMMENTS. Townes (1970) gave a habitus figure which is representative of the genus. One species, *N. enslini*, has been recorded from the Palearctic and several others are known from the Nearctic (Cushman, 1940; Townes, 1970) and the Neotropical (Townes, 1970) regions.

***Neorhacodes enslini* (Ruschka)**

(Figs 1, 2, 5–10)

Rhacodes enslini Ruschka, 1922: 138. Holotype ♀, Germany (NM).

Neorhacodes enslini (Ruschka); Hedicke, 1922: 427.

DESCRIPTION. Ocellar-ocular distance 0.60–0.70× distance between posterior ocelli; toruli separated by 1.5–1.8× greatest internal torular diameter; toruli distant from compound eyes by 0.6× greatest internal torular diameter; malar space 0.35–0.40× (♀) or 0.40–0.55× (♂) basal width of mandible; malar sulcus absent; antenna thirteen-segmented, with the third segment 3.5–4.0× (♀) or 3.4–3.7× (♂) as long as its greatest width and 1.5–1.6× as long as the fourth. Metapleural carina fine, varying from distinct and complete to only weakly indicated. Fore wing with radial cell 2.4–2.7× as long as wide (Fig. 1); vein Rs nebulous, not pigmented and weakly sinuate; 2m-cu spectral, unpigmented. Metasomal tergite two with thyridia distinct, transverse (Fig. 8); dorsal valve of ovipositor with subapical notch about 1.5× as long as deep (Fig. 9). Body black; antenna dark brown to black, base of flagellum, scape and pedicel often partly reddish or yellowish in female; clypeus sometimes reddish brown apically; mandibles rather variable in colour, black to reddish-brown; pterostigma mostly dark brown but with pale area in basal third (Fig. 1); legs dark brown to black but with femoral apices, front and mid tibiae and tarsi yellow to yellow-brown and hind tibia basally yellow-brown. Body length 2.3–2.5 mm (♀) or 2.2–2.6 mm (♂); fore wing length 2.0–2.3 mm (♀) or 2.0–2.2 mm (♂).

MATERIAL EXAMINED.

Austria: 2 ♀, Spitzzicken Bgld., 5.viii.1957 (*Fischer*) (BMNH). **Cyprus:** ♂, Ayia Mavi, Krios R., 7.ix.1937 (*Mavromoustakis*) (BMNH); 1 ♀, 1 ♂,

Kilani, Krios R., 12.ix.1937 (♀) and 1.x.1937 (♂) (*Mavromoustakis*) (BMNH); ♀, Limassol, 26.v.1934 (*Mavromoustakis*) (BMNH); ♂, Pera Pedi, 19.ix.1937 (*Mavromoustakis*) (BMNH). **France:** ♀, Var, 8 km south of St. Tropez, 2.ix.1986 (*Bouček*) (BMNH). **Great Britain:** 9 ♀, 1 ♂ Berkshire, Silwood Park, em. 26.vi.1968 (♀), 28.vi.1968 (♀) and 30.vi.1968 (♀) ex *Spilomena enslini* in *Rubus* stem, em. 29.vi.1968 (♀) ex *Spilomena troglodytes* in *Sambucus* stem trap nest, em. 30.vi.1966 (♀), 4.vii.1966 (♀), 24.vi.1968 (♀), 26.vi.1968 (♀) and 26.vi.1966 (♂) ex *Spilomena* sp. in *Rubus* stem and em. 28.vi.1968 (♀), ex *Spilomena enslini* in *Rubus* stem (*Danks*) (BMNH); 2 ♀ Berkshire, Emmer Green, SU718773, 26.vi.1995 and 31.vii.1995 (*Notton*) (REDMG); 2 ♀, 2 ♂ Cambridgeshire, Chippenham Fen, TL6569, coll. 9.v.1995, em. 29.v.1995 (2 ♀), coll. 9.v.1995, em. date unknown (2 ♂) ex *Spilomena differens* in dead *Rhamnus catharticus* poles (*Shaw*) (NMS); 8 ♀, 1 ♂ Cambridgeshire, Chippenham Fen, TL650693, Malaise trap, carr at edge of reed bed, 6–13.vii.1983 (♀), 8–21.viii.1983 (♂), 29.vi–9.vii.1984 (♀), 15–27.viii.1984 (2 ♀), 27.viii–27.ix.1984 (3 ♀) and 25.vi–9.vii.1985 (♀) (*Field*) (NMS); ♀ Devon, Torquay district, viii.1929 (*Nixon*) (BMNH); ♂ Hampshire, New Forest, Brockenhurst, 7.vii.1985 (*Bouček*) (BMNH); 2 ♀ Hampshire, West Wood, west of Winchester, coll. 3.ii.1985, em. (forced) 8.iii.1985, ex *Spilomena* sp. in *Rubus* stems (*Else*) (NMS); 2 ♀ Middlesex, Bedford Park, vi.1928 and 17.vii.1929 (*Waterston*) (BMNH); ♀ Oxfordshire, Taynton Fen, SP233148, Malaise trap, 7–28.vii.1989 (*Porter*) (NMS); 2 ♀, 1 ♂ Surrey, Albury Downs, em. 17.vi.1967 (♀) and em. 20.vi.1967 (♂) ex *S. enslini* in *Rubus* stem and em. 26.vi.1968 (♀) ex *Spilomena* sp. in *Rubus* stem (*Danks*) (BMNH); 2 ♂ Surrey, Leatherhead, em. 24.vi.1967 ex *S. troglodytes* in *Rubus* stem and em. 21.vi.1967 ex *Spilomena* sp. in *Rubus* stem (*Danks*) (BMNH); 2 ♂ Surrey, Newlands Corner, em. 23.vi.1967 ex *S. enslini* in *Rubus* stem and em. 20.vi.1967 ex *Spilomena* sp. in *Rubus* stem (*Danks*) (BMNH); ♀ Surrey, Surbiton, em. 24.vi.1968 ex *Spilomena* sp. in *Buddleia* stem (*Danks*) (BMNH); ♀ Sussex, Wadhurst, 4.ix.1981 (*Dicker*) (BMNH).

DISTRIBUTION. During this study material was seen from Austria, Cyprus, France and Great Britain, and the species is newly recorded from Austria and France. There are published records from much of Europe and also from the East Palaearctic, including Cyprus: (Fitton, 1984); Czech Republic (Šedivý, 1989); Finland (Blüthgen, 1953); Germany (Ruschka, 1922; Schmiedeknecht, 1930; Blüthgen, 1953; Horstmann, 1968); Hungary (Bajari, 1960); Italy (Scaramozzino, 1989); the Netherlands (Blüthgen, 1953; van Achter-

berg, 1976); Poland (Sawoniewicz, 1978, 1982 and 1986); Russia, including European area, St. Petersburg and the far East, Sakhalin (Tobias, 1963; Kasparyan, 1995); Spain (Rey del Castillo, 1991) and Great Britain and Ireland (Waterston, 1929; Stelfox, 1950; Danks, 1971; Fitton, 1984; Boston, 1986).

BIOLOGY. Danks (1971) provides the most detailed account of the biology of *N. enslini* to date: it has been recorded as a parasitoid of *Spilomena* species, and has been presumed to be a larval endoparasitoid. It overwinters in the host nest, presumably as a prepupa in its strongly constructed cocoon. *N. enslini* has been recorded during April to October but most often from June to September, suggesting plurivoltinism although clear evidence on the number of generations per year is lacking. Danks' (1971) rearings do not throw any light on this as he reared it mostly from nests collected in winter which would have been attacked the previous summer. It is not clear how many generations per year the host *Spilomena* species have: Danks (1971) speculates that *Spilomena* are bivoltine and Yarrow (1969) and Richards (1980) also note that some species have long seasons in Britain, from May to September, suggesting plurivoltinism. Previously recorded hosts of *N. enslini* include *S. enslini* Blüthgen and *S. troglodytes* (Vander Linden) (Hym., Sphecidae) nesting in many kinds of stems (Ruschka, 1922; Danks, 1971; Short, 1978; Kasparyan, 1981 & 1995). Although *Rubus fruticosus* (agg.) stems are the most commonly recorded substrate this is probably a sampling artifact as *Rubus* stems are much easier to collect and rear insects from than more massive dead wood. *N. enslini* will certainly attack hosts in more substantial substrates and it is recorded here from *Spilomena differens* Blüthgen in standing dead *Rhamnus catharticus* poles of about 3 cm in diameter. Since the species of *Spilomena* are notoriously difficult to identify (Blüthgen, 1953; Horstmann, 1968; Yarrow, 1969) and their taxonomy is still in a state of flux (Archer, M., pers. com.) published host records should be regarded with caution and new rearings should be investigated with care, expressing an appropriate amount of doubt as to the identification of the host, although it seems likely that *N. enslini* will prove to attack all *Spilomena* species in the region.

COMMENTS. The apical antennal segment occasionally shows traces of a suture indicating that it is derived from the fusion of at least two segments; however this suture is virtually never complete and, of all the material examined above, in only one female was the suture sufficiently complete on one antenna that it could be considered fourteen segmented. Otherwise thirteen-segmented antenna are the norm. The male genital capsule has been figured by Tobias (1963), the habitus of the mature larva by Danks (1971) and the head sclerites of the mature larva by Horstmann (1968), Short (1978) and most successfully by Danks (1971).

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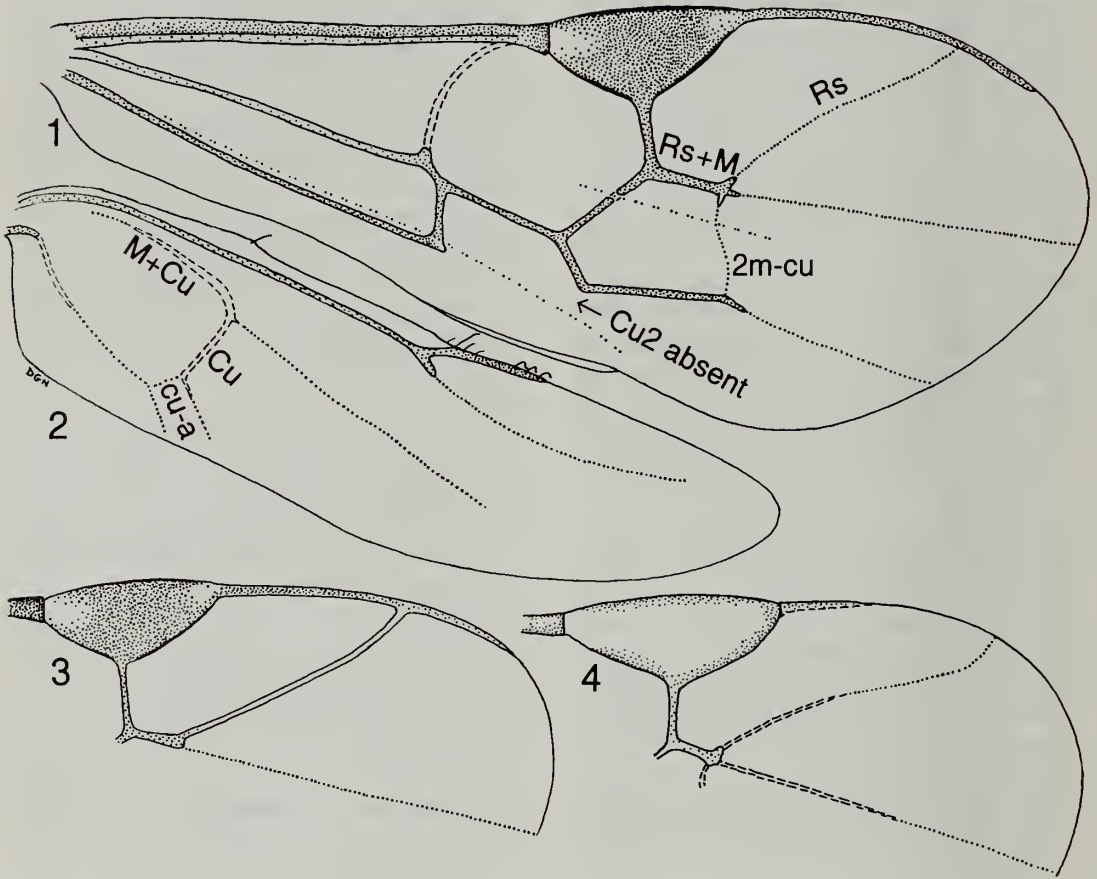
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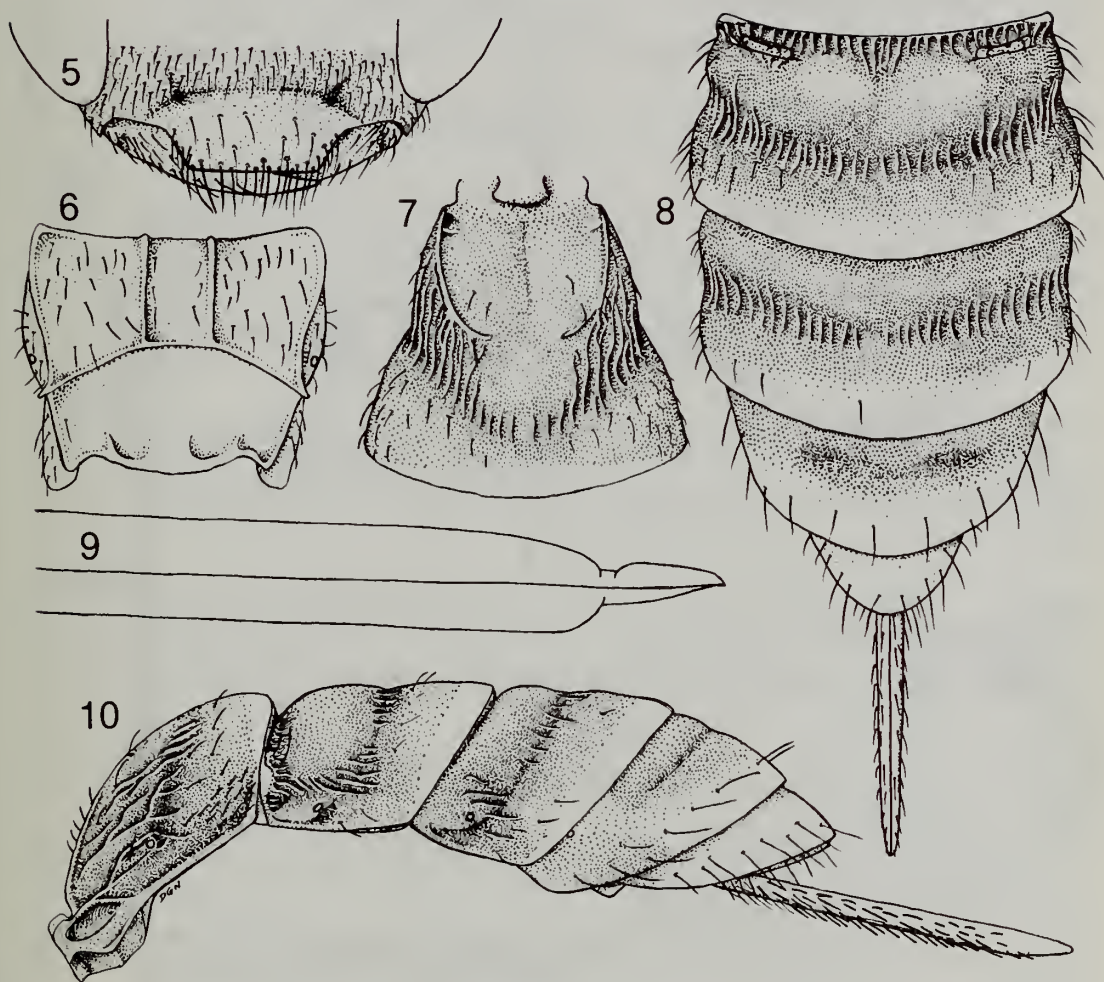
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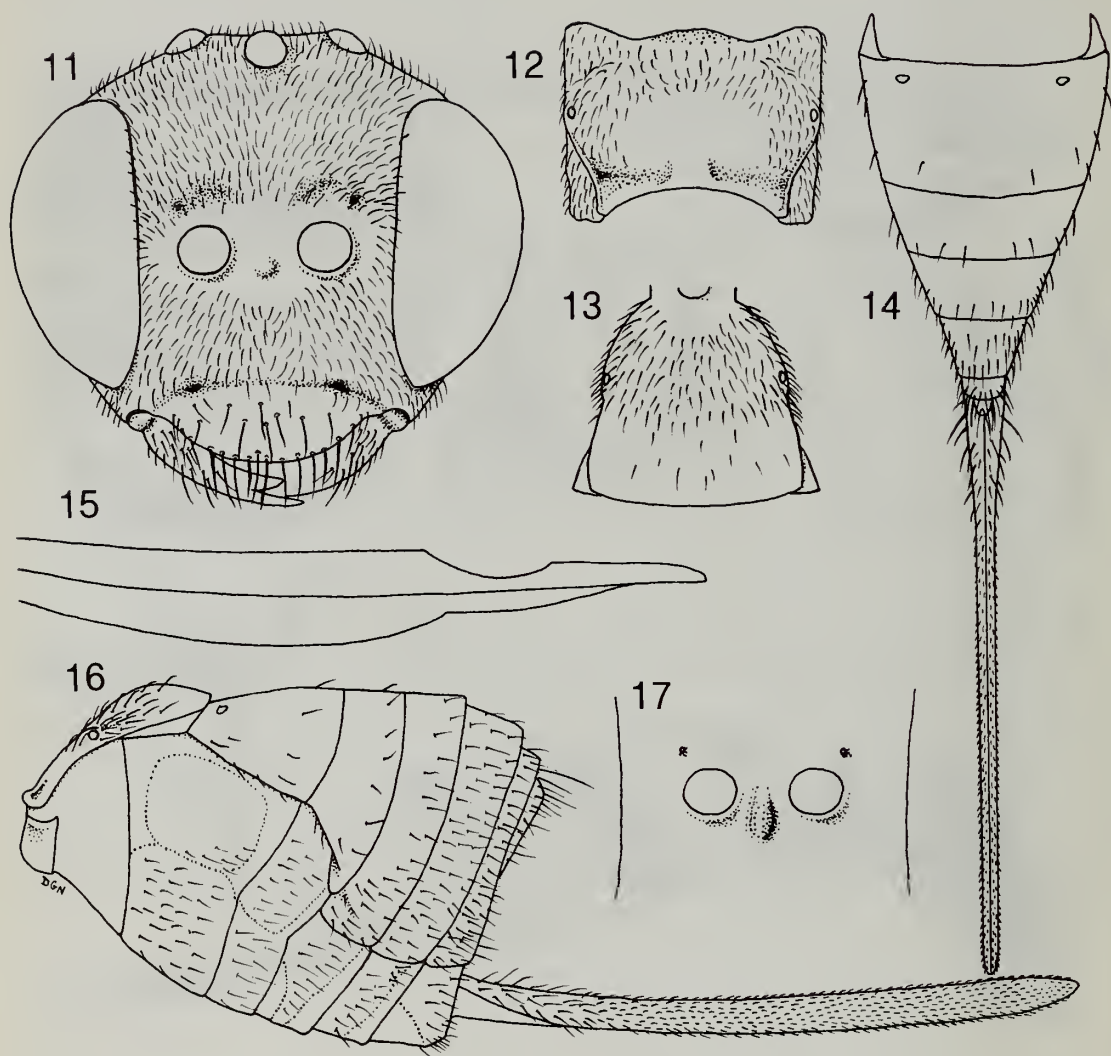
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Figs 1–2. *Neorhacodes enslini* – 1, fore wing; 2, hind wing. Fig. 3 *Eremura perepetshaenkoi* – fore wing (part), showing pterostigma and radial cell, holotype ♀. Fig. 4 *E. turkmenica* – fore wing (part), showing pterostigma and radial cell, paratype ♀.



Figs 5–10. *Neorhacodes enslini* – 5, lower face, clypeus and mandibles, anterior; 6, propodeum, dorsal; 7, metasomal tergite one, dorsal; 8, metasomal tergites two and beyond, dorsal; 9, ovipositor tip, lateral; 10, metasoma, lateral.



Figs 11–16. *Eremura perepetshaenkoi* – 11, head, anterior, holotype ♀; 12, propodeum, dorsal; 13, metasomal tergite one, dorsal; 14, metasomal tergites two and beyond, dorsal; 15, ovipositor tip, lateral; 16, metasoma, lateral, holotype ♀. **Fig. 17** *E. turkmenica* – head (part), anterior, showing position of toruli, paratype ♀.